

1. The probability of any event must be between 0 and 1.

2. You draw one card from a standard deck of 52 cards.

a) What is the probability that the card is the ace of spades?

$$\frac{1}{52}$$

b) What is the probability that the card is a face card (jack, queen king)?

$$\frac{12}{52} = \frac{3}{13}$$

c) What is the probability that the card is an ace or a spade?

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{4}{13}$$

3. You roll two fair dice.

a) What is the probability of getting a number less than 5 on both dice?

$$\frac{4}{6} \cdot \frac{4}{6} = \frac{4}{9}$$

b) What is the probability of getting a sum of 9 on the two dice?

$$\frac{4}{36} = \frac{1}{9}$$

c) What is the probability of getting a 5 on both?

$$\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$$

Combinations and Permutations

4. A six-person jury must be selected from a pool of 15 jurors. How many ways can a group of six be selected?

$${}_{15}C_6 = 5005$$

5. How many ways can we rearrange the letters of MATHEMATICS?

$$\frac{11!}{2!2!2!} = 4,989,600$$

6. How many ways can we rearrange the letters of MASSACHUSETTS?

$$\frac{13!}{2!4!2!} = 64,864,800$$

7. How many possible employees can attend a business seminar if I select 2 of 8 employees?

$${}_8C_2 = 28$$

8. How many combinations are there to choose the first, second, and third places in a race with 22 runners?

$${}_{22}P_3 = 9,240$$

Probability

9. If one card is drawn at random from a standard deck of cards, what is the probability of randomly selecting a 10 or a red card?

$$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

10. If a fair six sided die is rolled, what is the probability of rolling an odd number or a number less than 4?

$$\frac{3}{6} + \frac{3}{6} - \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$$

Counting Principle

11. How many different license plates are possible with two letters followed by three digits?

$$26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 = 676,000$$

12. How many 4 – digit personal identification codes can be formed if each numeral can only be used once?

$$10 \cdot 9 \cdot 8 \cdot 7 = 5040$$

13. Suppose you decide to buy a car. Among the options you may choose from are 6 paint colors, 3 interior colors, and 2 transmissions. How many different options do you have?

$$6 \cdot 3 \cdot 2 = 36$$

14. If LA, Boston, Philadelphia, and Austin are visited in random order, each city visited once.

a) Find the probability that Austin will be visited first, Boston second, LA third, and Philadelphia last.

$$\frac{1}{4} \cdot \frac{1}{3} \cdot \frac{1}{2} \cdot \frac{1}{1} = \frac{1}{24}$$

b) Find the probability that Philadelphia will be visited first.

$$\frac{1}{4} \cdot \frac{3}{3} \cdot \frac{2}{2} \cdot \frac{1}{1} = \frac{1}{4}$$

15. A committee of four people is to be selected from six Democrats and four Republicans.

a) Find the probability that all are Democrats.

$$\frac{{}_6C_4}{{}_{10}C_4} = \frac{15}{210} = \frac{1}{14}$$

b) Find the probability that two are Democrats and two are Republicans.

$$\frac{{}_6C_2 \cdot {}_4C_2}{{}_{10}C_4} = \frac{15 \cdot 6}{210} = \frac{3}{7}$$